RESEARCH PAPER

Previous Out-of-Pocket Drug Expenditures and Patterns of Antidepressant Use among Workers Receiving Depression-Related Disability Benefits

Dépenses remboursables pour médicaments et schémas d'utilisation d'antidépresseurs chez les salariés qui reçoivent des prestations d'invalidité liées à la dépression

by CAROLYN S. DEWA, MPH, PHD
Work & Well-being Research & Evaluation Program and
Health Systems Research & Consulting Unit
Centre for Addiction and Mental Health
Departments of Psychiatry and Health Policy, Management & Evaluation
University of Toronto, Toronto, ON

JEFFREY S. HOCH, PHD
Department of Health Policy, Management & Evaluation
University of Toronto
Centre for Research on Inner City Health, The Keenan Research Centre
Li Ka Shing Knowledge Institute, St. Michael's Hospital, Toronto, ON

PAULA GOERING, RN, PHD
Health Systems Research & Consulting Unit
Centre for Addiction and Mental Health
Departments of Psychiatry and Health Policy, Management & Evaluation
University of Toronto
Toronto, ON

Abstract

This study explored the effects of out-of-pocket expenditures on antidepressant use among workers receiving depression-related short-term disability benefits. The authors examine the association between workers' out-of-pocket expenditures prior to their disability episode and their use, or delay in use, of antidepressants during the episode.

The results indicate that higher out-of-pocket expenditures for antidepressants prior to the disability episode were associated with higher odds of using an antidepressant during the episode. However, results also suggested that higher out-of-pocket expenditures for other prescriptions were associated with significantly lower odds of an antidepressant claim during the episode.

Greater prior out-of-pocket expenditures for other prescription drugs may serve as a barrier to accessing antidepressant treatment. Workers receiving short-term disability benefits who have previously purchased prescriptions for other conditions may be more sensitive to out-of-pocket expenditures for antidepressant prescriptions.

Résumé

Cette étude se penche sur les effets des dépenses remboursables pour les antidépresseurs au sein des salariés recevant des prestations d'invalidité de courte durée pour des problèmes de dépression. Les auteurs examinent la relation entre les dépenses remboursables préalables aux périodes d'invalidité des salariés et l'utilisation, ou les délais d'utilisation, des antidépresseurs pendant ces périodes.

Les résultats indiquent que des dépenses remboursables plus élevées pour antidépresseurs préalables aux périodes d'invalidité sont associées à de plus grandes probabilités d'utilisation d'antidépresseurs pendant ces périodes. Toutefois, les résultats portent à croire que des dépenses remboursables plus élevées pour d'autres types d'ordonnances sont associées à des probabilités significativement plus faibles de demandes de prestations pour des antidépresseurs pendant les périodes d'invalidité.

Des dépenses remboursables anticipées plus élevées pour d'autres types d'ordonnances peuvent freiner l'accès aux traitements antidépresseurs. Les salariés qui reçoivent des prestations d'invalidité à court terme et qui ont préalablement acheté des médicaments prescrits pour d'autres états de santé sont peut-être plus enclins aux dépenses remboursables liées aux ordonnances pour antidépresseurs.

Compared to the rest of the working population, individuals with a mental disorder have greater numbers of days during which they are either unproductive or unable to function at full capacity (Dewa and Lin 2000;

Lim et al. 2000). About one-third of society's depression-related productivity losses can be attributed to these work disruptions (Greenberg et al. 2003).

This study builds on previous work in which we observed that timely antidepressant use was associated with significant decreases in disability for workers on depression-related, short-term disability leave (SDIS) (Dewa et al. 2003). In this analysis, we examine the association between prior out-of-pocket drug expenditures and timely antidepressant use. We look at three outcomes in relation to previous annual out-of-pocket expenditures: (a) the likelihood of filling an antidepressant prescription during SDIS, (b) the likelihood of starting an antidepressant after SDIS begins and (c) the length of time before starting an antidepressant after SDIS begins.

Background

Treatment guidelines for depression and rising prescription drug costs

Depression treatment guidelines recommend antidepressants as an effective treatment modality (AHCPR 1993; APA 1993; CANMAT 1999). Recommended use of antidepressants is associated with increased productivity and decreased disability (Berndt et al. 1998; Dewa et al. 2003).

At the same time, antidepressants have played a prominent role in the rise of prescription drug expenditures (Foote and Etheredge 2000; Dewa and Goering 2001). Since the newer generation of antidepressants were introduced in the 1980s, antidepressant use has grown significantly (Olfson et al. 2002). Between 1998 and 2004, Canadian per capita expenditures on psychotherapeutics increased by 106% (Morgan et al. 2005). In 2004 in Canada, psychotherapeutics was the second largest category of prescription drugs used (Morgan et al. 2005). More than half the spending on psychotherapeutics was related to the use of selective serotonin reuptake inhibitors (SSRIs) (Morgan et al. 2005). Depression guidelines identify SSRIs as first-line agents (AHCPR 1993; APA 1993; CANMAT 1999).

Co-occurring chronic physical disorders

Depression treatment is often complicated by co-occurring physical disorders requiring prescription drug treatment (Elinson et al. 2004). Treatments for certain chronic and acute physical conditions may contribute to or predate depression (Miranda et al. 1994), and people with depression tend to have high rates of chronic medical conditions (Miranda et al. 1994). Thus, employees whose private drug benefits plan includes cost-sharing arrangements may already be spending a significant amount for prescription drugs prior to their depression-related disability.

Short-term disability benefits

The purpose of disability income insurance is "to provide income protection for workers during temporary absences from work due to illnesses or injury" (Roberts 1994). Typically, short-term disability benefits cover a portion of the worker's salary as determined by the company. In Australia, typical benefits provide a salary continuance of 75% (Archibald et al. 2007). In the United States, typical coverage is for 50% to 100% of income; in Canada, it is between 60% and 100% of coverage for salaried employees but only 55% to 77% for hourly employees (Archibald et al. 2007).

Demand for psychotropic drugs and cost-sharing

A number of studies have reported that the use of psychotropic prescription drugs is characterized by high sensitivity to out-of-pocket costs (Tamblyn et al. 2001; Piette et al. 2004) among the elderly and financially disadvantaged populations.

Few studies have looked specifically at the working population in terms of disability. Because workers generally receive only a proportion of their wages during a disability episode, they may be particularly sensitive to cost-sharing. In combination, the decreased income and drug cost-sharing may act as barriers to accessing optimal antidepressant treatment.

Methods

Data sources and study population

The study protocol was reviewed and approved by the University of Toronto/Centre for Addiction and Mental Health Research Ethics Board. Administrative data were provided by three major Canadian financial/insurance sector employers with a combined workforce of approximately 63,000 employees nationwide, representing approximately 12% of their sector's workforce (Statistics Canada 2003). The primary information sources were company short-term disability claims, prescription drug claims and occupational health department records. Because of its relatively smaller size, claims from one company were taken for short-term disability episodes beginning between January 1996 and December 1998. For the remaining two companies, data were abstracted for claims beginning in 1997 or 1998.

Employees included in our analysis met two criteria. First, subjects were on depression-related, short-term disability leave from work. This meant they had depression-related absences from work for at least 10 consecutive work days prior to their disability leave. This cut-off was based on the study companies' SDIS criteria. The second criterion required subjects to have used their prescription drug benefits at least once during the study period for any type of prescription.

Prescription drugs are currently not covered under the *Canada Health Act* unless they are dispensed during an inpatient stay. However, certain provinces such as Alberta, British Columbia, Manitoba, Quebec and Saskatchewan offer prescription drug insurance to their residents. Each of these provincial plans has either a premium, co-payment or out-of-pocket limit attached to them. The other provinces offer coverage to specific segments of the population, such as the elderly and financially disadvantaged (Dewa et al. 2005). As result, prescription drug benefits are often offered by employers under supplemental private medical insurance plans (all other essential medical services and treatments, including physician visits and hospitalizations, are covered in full through the public system).

Subjects were excluded if, based on the drug claims data, we could not ascertain whether their lack of antidepressant claims (during the disability period) was due to not filling a prescription or using another drug benefits plan.

Dependent variables

Two dependent variables were created to reflect antidepressant use:

- FILLED = 1 if a worker filled an antidepressant prescription between the start and end of the SDIS. Otherwise, FILLED = 0.
- DAYS = the number of days before filling an antidepressant prescription for workers who had not filled an antidepressant prescription before the start of the SDIS episode. DAYS is undefined for workers filling antidepressant prescriptions before the SDIS episode. DAYS = the length of the SDIS episode for workers who went their entire SDIS episode without filling an antidepressant prescription.

Independent variables

Six categories of variables were created for the purpose of these analyses: socio-demographic characteristics, employment characteristics, severity-of-course indicators, co-occurring chronic physical disorders, prior out-of-pocket spending on prescription drugs and company and province fixed effects.

SOCIO-DEMOGRAPHIC CHARACTERISTICS

The socio-demographic variables were age and sex. The age variable was calculated as the number of years between the worker's date of birth and the starting date of the disability episode.

EMPLOYMENT CHARACTERISTICS

We created variables to describe employment characteristics. The first variable indicated whether the subject was in a management position (i.e., supervisor/manager). The second variable was the subject's tenure with the company. Tenure was calculated as the difference between the worker's hire date and the starting date of the disability episode.

SEVERTY-OF-COURSE INDICATORS

We posited that antidepressant use might be influenced by the severity of the episode. Using the number of symptoms as a proxy for severity, we abstracted information from occupational health records using a checklist covering the major DSM-IV depressive symptom categories (APA 2000). Results of previous analyses with this population indicated that the number of reported symptoms was significantly related to length of disability and return to work; additional symptoms were associated with longer disability episodes and lower likelihood of return to work (Dewa et al. 2003).

We also created a variable to indicate whether the SDIS was attributed to depression only or to depression co-morbid with either another mental or a physical problem. Finally, as another proxy for severity, we developed a variable to indicate whether a worker had a prior SDIS episode during the past 12 months.

CO-OCCURRING CHRONIC PHYSICAL DISORDERS

We created variables to indicate the presence of chronic physical disorders using Von Korff and colleagues' algorithm (1992), which utilizes claims data on the types of medications that the individual filled.

PRIOR OUT-OF-POCKET EXPENDITURES

We created two out-of-pocket expenditure variables based on drug claims one year prior to the start of the short-term disability episode. One of the variables captured total prior out-of-pocket expenditures on antidepressants. The other variable reflected total prior out-of-pocket expenditures on all other types of prescription medications.

COMPANY FIXED EFFECTS

Because non-random, company-specific factors associated with antidepressant use may exist, we included company-specific fixed effects in all the models.

PROVINCE FIXED EFFECTS

To control for possible regional culture effects, we included province indicator variables in the models.

Analyses

The analysis plan is framed along the lines of a two-part model, a strategy commonly employed to study characteristics associated with prescription drug use patterns (Manning 1981; Duan et al. 1983; Leibowitz et al. 1985; Hillman et al. 1999).

Part 1: Any antidepressant claim?

The first part of the model focused on the relationship between previous out-of-pocket expenditures and the odds that a worker had any antidepressant drug benefits claim during the SDIS episode. Using a multiple logistic regression model, we estimated the odds of having an antidepressant drug claim as a function of the subject's age, job tenure with the firm, severity, sex, management status, co-morbid physical disorders, prior 12-month mental illness-related SDIS, province, firm and cumulative out-of-pocket expenditures (for both antidepressant and non-antidepressant drugs). Cumulative previous out-of-pocket expenditures were separated into antidepressant and non-antidepressant categories to allow for differential effects.

Part 2: How long before starting an antidepressant after SDIS begins?

Part 2 of the model focused on estimating the relationship between out-of-pocket expenditures and delay in the first use of antidepressants. The analysis included only workers who had not filled an antidepressant prescription before their depression-related SDIS started. Thus, total previous out-of-pocket expenditures were not split into antidepressant and non-antidepressant categories, since for this sample total out-of-pocket expenditures exactly equalled non-antidepressant expenditures.

Initially, we estimated the delay in filling a first antidepressant prescription using ordinary least squares (OLS) regression (results available from the authors); however, more complex survival models seemed better suited for the task. With survival analysis, we were able to use the data both from employees with a first antidepressant claim during the SDIS period (n=197) and from employees with no antidepressant claim during the SDIS period (n=164). Employees who started filling antidepressant prescriptions before the SDIS period were not included in this analysis as they did not inform the study question (n=345). As a sensitivity analysis, we compare results from non-parametric (Kaplan-Meier analysis), semi-parametric (Cox regression) and parametric survival models (Weibull regression).

Results

Demographic characteristics, depression severity, presence of co-occurring chronic disorders and out-of-pocket expenditures prior to the SDIS episode are shown in

Table 1. An in-depth analysis of the demographic characteristics of this population can be found elsewhere (Dewa et al. 2002). In this sample, a large proportion was female with a mean age of 40.7 years (SD=9.06). About 25% of the sample held management positions and had worked for their companies an average of 13.3 years (SD=8.86).

TABLE 1. Study population descriptive characteristics (standard deviations in parentheses)

VARIABLES	%	n
TOTAL	**100%**	**706**
Demographic		
Sex		
Male	14.0	99
Female	86.0	607
Mean Age	40.7	(9.06)
Employment characteristics		
Management position	24.2	171
Average length of employment w/company (in yrs)	13.31	(8.86)
Symptom and complexity		
Prior episode within past 12 months	15.6	110
Depression only	52.7	372
Average no. of reported symptoms	4.76	(2.75)
Co-occurring chronic physical disorders	49.0	346
Heart disease	8.01	57
Respiratory disease	9.4	66
Hypertension	14.2	100
Asthma	7.8	55
Ulcers	20.8	147
High cholesterol	3.5	25
Neurological disorders	9.9	70
Other chronic disorders	2.6	18
Province		
British Columbia	13.9	98
Alberta	12.0	85
Saskatchewan	2.6	18
Manitoba	3.4	27
Ontario	53.4	377
Quebec	8.6	61
Smaller provinces (Atlantic and territories)	5.5	39

Table 1. Continued

Sites		
Site 1	5.1	36
Site 2	44.3	313
Site 3	50.6	357

For 15.6% of this sample, the disability episode was a recurrent one. On average, 4.8 symptoms (SD=2.75) were reported. More than half (52.7%) reported having depression only.

Almost 21% filled a prescription for ulcer medications; 14% were using hypertension medications. About 10% used a neurological disorder drug; 8% took medication for heart disease and 9% for respiratory disease.

About 74% used an antidepressant during their SDIS episode (Table 2). For those who waited until the start of their disability episode, the mean days until their first fill was 26.6 days (SD= 29.62).

TABLE 2. Antidepressant use patterns (standard deviations in parentheses)

Variables	**%**	**n**
% with no antidepressant claim before or during SDIS	25.8	182
% with an antidepressant claim after the start of SDIS	74.2	524
% with first claim before the start of SDIS	62.4	327
% with first claim during SDIS	37.6	197
Total	100	706
Mean out-of-pocket expenditures for prescription drugs prior to SDIS		
Antidepressants	$21.64	(51.48)
Other drugs	$72.15	(107.30)

The mean out-of-pocket expenditure for antidepressants prior to the disability episode was $21.64 (SD=51.48). For other prescription drugs it was $72.15 (SD=107.30).

In the first regression model, we examined the association between out-of-pocket expenditures and the odds that a worker filled an antidepressant prescription between the start and end of the SDIS episode, controlling for demographic characteristics, severity, work status, chronic physical disorders and company and provincial dummy variables (Table 3). The results suggest that the odds of a worker filling an antidepressant prescription increase with prior out-of-pocket antidepressant expenditures (for every $10 spent, odds ratio [OR] = 1.478, 95% confidence interval [CI] = 1.271, 1.715). At the same time, the odds decrease as prior non-antidepressant out-of-pocket expenditures increase (for every $10 spent, OR = 0.954, 95% CI = 0.933, 0.975).

Figures 1 and 2 illustrate these two main findings. The graph in Figure 1 indicates that if prior out-of-pocket expenditures on non-antidepressants equalled $0, the probability of a worker's filling an antidepressant prescription was almost 90%. But if past-year expenditures were $100, the probability of a worker's filling an antidepressant prescription dropped to 70%. It decreased to 40% if expenditures were $500.

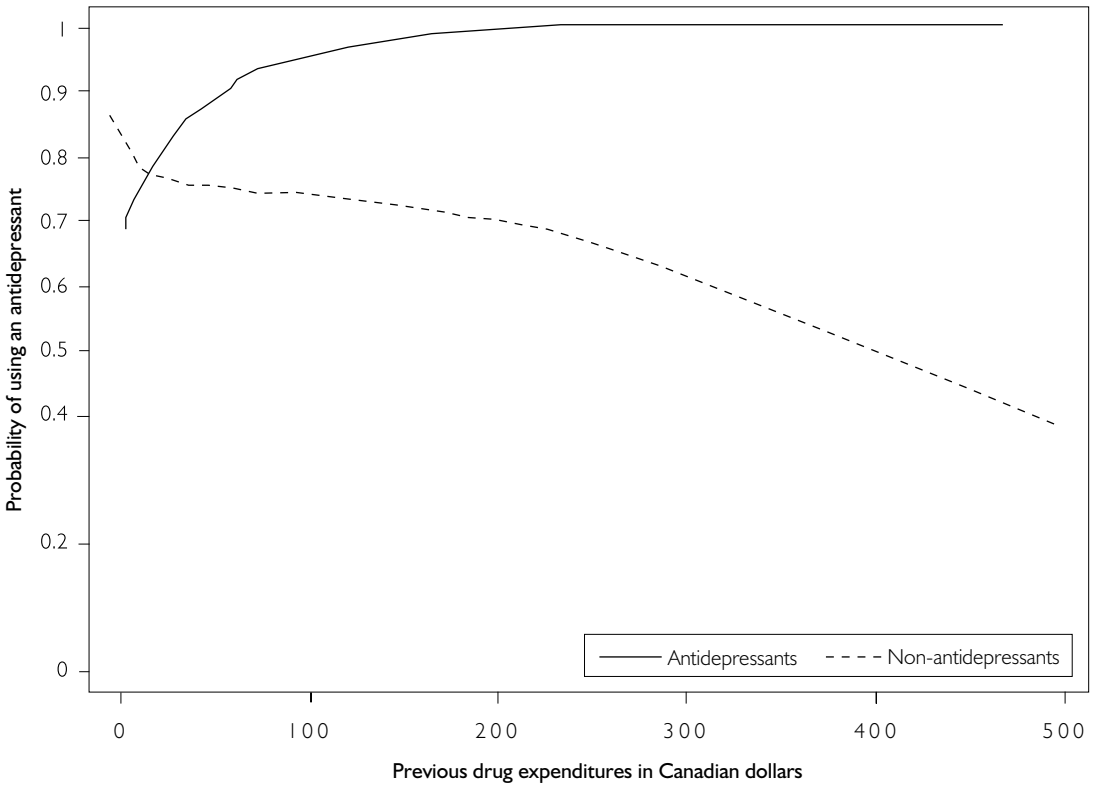
TABLE 3. Selected logistic regression results predicting whether an employee had an antidepressant claim (adjusted for provincial fixed effects)

	Had an antidepressant claim	
Variables	**Odds Ratio**	**95% CI**
Demographic variables		
Female	1.032	(0.586, 1.818)
Age	1.008	(0.980, 1.037)
Employment characteristics		
Management	1.217	(0.752, 1.967)
Length of employment	1.034	(1.002, 1.067)
Company 1	0.634	(0.228, 1.764)
Company 2	0.509	(0.326, 0.795)
Symptom and complexity variables		
Number of symptoms	1.207	(1.112, 1.311)
Prior episode in past 12-months	0.806	(0.447, 1.455)
Depression only	2.402	(1.705, 2.517)
Co-occurring chronic physical disorders		
Heart disease	0.753	(0.345, 1.640)
Respiratory disease	3.172	(1.395, 7.210)
Hypertension	1.408	(0.720, 2.752)
Asthma	0.814	(0.398, 1.663)
Ulcers	1.399	(0.843, 2.322)
High cholesterol	2.730	(0.764, 9.749)
Neurological disorders	1.522	(0.739, 3.134)
Other chronic disorders	1.983	(0.417, 9.459)
Out-of-pocket expenditures prior to SDIS (in $10 increments)		
For antidepressant	1.478	(1.271, 1.715)
For other drugs	0.954	(0.933, 0.975)
Hosmer-Lemeshow $\chi^2_{(8)}$ (p-value)	8.22	(0.4121)
Pseudo-R^2	0.1891 (n=706)	

In contrast, workers with no prior out-of-pocket expenditures on antidepressants had a 70% probability of filling an antidepressant prescription. With more prior antidepressant use (as indicated by increased prior out-of-pocket antidepressant expenditures), the probability of workers' filling an antidepressant prescription increased.

In the second model, we controlled for the same characteristics as in the first model while examining the association between out-of-pocket expenditures and the number of days before filling an antidepressant prescription. To facilitate the interpretation of the regression results, we created a new indicator variable equalling 1 (equalling 0) when out-of-pocket expenditures were above (below) the median of $43.50. A log-rank test rejected the equality of the survivor functions (probability of not filling an antidepressant prescription after time t) by whether out-of-pocket expenditures were above (below) the median ($\chi^2_{(1)}$=7.25, p=0.0071). Figure 2, showing the Kaplan-Meier survival estimates by whether out-of-pocket expenditures were above (below) the median, provides visual confirmation of the difference between workers with high and low out-of-pocket expenditures.

FIGURE 1. Predicted probability of using an antidepressant as a function of previous drug expenditures by type of drug (antidepressants vs. non-antidepressants)

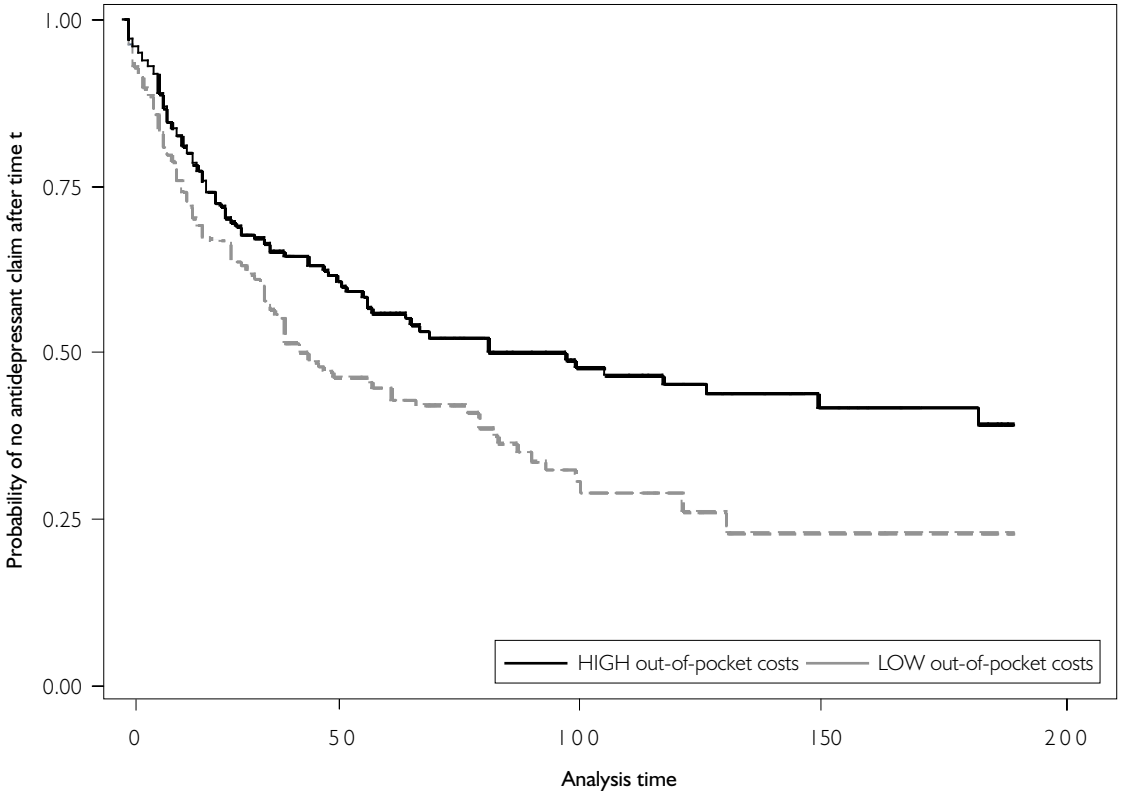


Note: Figure 1 shows the results from a logistic regression predicting an antidepressant claim during the SDIS episode. The complete regression results are reported in Table 3.

Table 4 contains the results from two types of survival analysis models. Using the Cox model, we estimated the hazard ratio for out-of-pocket expenditures above (below) the median to be 0.617 (z=–2.89, p=0.004) and 0.579 using Weibull regression

(z=−3.26, p=.001). The estimated hazard ratio less than 1.000 for the indicator variable means that workers with high out-of-pocket expenditures were less likely to fill an antidepressant prescription during the SDIS episode (technically speaking, the hazard for workers with out-of-pocket expenditures above the median was about 60% of that for workers with out-of-pocket expenditures below the median). The difference in median time before filling a first antidepressant prescription was estimated to be approximately 36 more days when out-of-pocket expenditures were above the median.

FIGURE 2. Probability of no antidepressant claim as a function of time by level of out-of-pocket costs (e.g., high vs. low out-of-pocket costs)



Note: Figure 2 shows Kaplan-Meier survivor curves from the analysis of time (days) until a first antidepressant prescription during the SDIS episode. Employees returning from SDIS without having filled an antidepressant prescription during the SDIS episode have "censored" data. The complete regression results are reported in Table 4. The group with high out-of-pocket costs was those with expenditures that were above the median. The group with low out-of-pocket expense was those with expenditures that were below the median.

TABLE 4. Selected survival analysis regression results for first antidepressant use (adjusted for provincial fixed effects)

	Cox Proportional Hazard		Weibull Regression	
Variables	**Hazard Ratio**	**95% CI**	**Hazard Ratio**	**95% CI**
Demographic Variables				
Female	1.039	(0.662, 1.632)	1.004	(0.638, 1.580)
Age	0.998	(0.977, 1.020)	0.996	(0.975, 1.018)
Employment characteristics				
Management	0.997	(0.709, 1.402)	0.960	(0.681, 1.353)
Length of employment	1.032	(1.009, 1.056)	1.035	(1.011, 1.059)
Company 1	1.278	(0.644, 2.537)	1.398	(0.708, 2.761)
Company 2	0.587	(0.418, 0.823)	0.583	(0.416, 0.818)
Symptom and complexity variables				
Number of symptoms	1.055	(0.992, 1.122)	1.044	(0.982, 1.111)
Prior episode in past 12 months	0.518	(0.297, 0.903)	0.465	(0.266, 0.812)
Depression only	1.307	(0.973, 1.756)	1.336	(0.994, 1.797)
Co-occurring chronic physical disorders				
Heart disease	0.654	(0.370, 1.156)	0.622	(0.352, 1.100)
Respiratory disease	2.060	(1.211, 3.505)	2.244	(1.318, 3.822)
Hypertension	1.064	(0.671, 1.688)	1.163	(0.733, 1.845)
Asthma	1.317	(0.786, 2.205)	1.324	(0.788, 2.223)
Ulcers	1.228	(0.837, 1.801)	1.222	(0.832, 1.797)
High cholesterol	1.779	(0.841, 3.763)	1.966	(0.931, 4.150)
Neurological disorders	1.027	(0.621, 1.700)	1.037	(0.625, 1.721)
Other chronic disorders	2.082	(0.916, 4.729)	2.107	(0.927, 4.790)
Out-of-pocket expenditures prior to SDIS (for non-antidepressant drugs)				
Above the median cost of $43.50	0.617	(1.271, 1.715)	0.579	(0.417, 0.804)
LR $\chi^2_{(24)}$ (p-value)	62.38	(<0.001)	70.52	(<0.001)
Sample size	n=379		n=379	

Discussion

The results appear to indicate two primary use patterns. First, the positive association between prior antidepressant spending and the higher likelihood of subsequent spending suggests that if workers have experience with antidepressants, they may be more likely to view them as non-discretionary drugs. This is a positive finding if it suggests adherence to antidepressant use, an issue that is frequently of concern in depression treatment (Simon et al. 1993; Katon et al. 1995). At the same time, it raises the question of what the impact would be on other prescriptions for chronic physical conditions.

About 50% of these workers with depression-related SDIS had a co-morbid chronic physical disorder for which they were receiving prescription drug treatment. Our results indicate that greater prior out-of-pocket expenditures for other prescription drugs may serve as a barrier to accessing antidepressant treatment. These results are congruent with findings reported by Motheral and Fairman (1997) and Goldman et al. (2000). Individuals who had previously purchased prescriptions for other conditions might have been more sensitive to the out-of-pocket expenditure of an antidepressant prescription. If this sensitivity results in a delay in use, it could be problematic. For example, a delay in antidepressant use during the first 30 days of an SDIS episode has been associated with a longer leave of 24 days (Dewa et al. 2003). The average hourly wage for a worker between 25 and 55 years is $21.66 (Statistics Canada 2007). Based on a 7.5-hour workday and the loss of 18 workdays (excluding six weekend days), the delay in antidepressant use would cost an average of $2,924 extra per worker on SDIS.

This finding highlights the dilemma faced by many employers. On the one hand, there is the desire to control the rising cost of prescription drug benefits caused by the decreased sensitivity to costs associated with insurance benefits; on the other hand, it is important not to create a barrier to access to these treatments.

More research is needed to evaluate whether cost-sharing mechanisms should be altered for workers on disability leave, especially those with chronic physical conditions (Elinson et al. 2004).

Limitations

Our results should be considered in light of several limitations. First, our sample contained a high proportion of women. Two main factors likely contributed to this finding: (a) the sector we are studying is female dominated – approximately 30% of all Canadian women are employed in business, finance and administrative occupations (Statistics Canada 2003) and (b) the prevalence of depression is higher among women than men (Kessler et al. 1996; Offord et al. 1996). An important question is whether our findings hold true in other sectors, especially those that are male dominated.

Second, our reliance on administrative data constrains our ability to comment on actual use (Edgell et al. 1999). It is assumed that workers who filled prescriptions also took their medications. To the extent that this assumption is valid, our measure of use reflects a combination of use and physician prescribing patterns.

Third, as with most administrative database studies, our results are limited by the accuracy of the diagnosis on the claims forms (Browne et al. 1998). Ideally, we would have conducted clinical assessments for cases to verify the cause of the SDIS. But in the interests of feasibility and maintaining worker anonymity, we chose to study the population identified with depression rather than those confirmed with depression.

Finally, this study focused on previous annual out-of-pocket expenditures. It is possible that something related to out-of-pocket drug expenditures but not captured in the administrative data could explain our results.

Technically, an individual's prior spending on drugs is a choice variable that may be correlated with unobserved determinants of current antidepressant use. The nature of our non-randomized administrative data does not allow us to pinpoint the causal reason for our findings. Along those same lines, it would have been ideal had we understood the motivations underlying worker behaviour. Specifically, an estimate of the sensitivity of the workers' demand to the price of prescription drugs would have been useful. With current data limitations, an alternative explanation for the significant positive relationship between past experience with antidepressants and current use would be that workers are insensitive to all prescription drug prices and are willing to purchase any prescription drug without regard for price. On the other hand, if this were the case, we would expect to see a positive association between prior out-of-pocket spending for other drugs and antidepressant use.

Our research represents a first step towards understanding disabled employees' sensitivities to costs; it examines questions about the association between expenditures and antidepressant use. Further research should focus on identifying the mechanisms that underlie the observed association.

Conclusions

In previous work, we found an association between timely antidepressant use and decreased length of depression-related disability leave (Dewa et al. 2003). Results from this study suggest another potential link in the chain between employee out-of-pocket expenditures and employer productivity losses associated with depression-related disability claims. In light of antidepressants' contribution to return to work, it might be worthwhile for companies and benefits managers to examine their drug benefits plan structures (e.g., deductible limits). While moral hazard may be a valid general concern, if out-of-pocket expenditures reduce access to prescription drugs, it may be important to consider cost-containment strategies that take into account disability and chronic conditions. Nevertheless, more research is needed to confirm and explore the exact process by which costs and antidepressant use are related.

ACKNOWLEDGEMENTS

Drs. Hoch and Dewa are grateful for the support provided by the Ontario Ministry of Health and Long-Term Care Career Scientist Awards that they received during the project. Dr. Dewa is funded by the Canadian Institutes of Health Research (CIHR) Institute for Population and Public Health/Public Health Agency of Canada Applied

Public Health Chair. This project was funded by a grant from CIHR)grant no. MOP-53108). The authors are grateful for the valuable comments and suggestions from the editors and three anonymous reviewers. Any remaining errors are the sole responsibility of the authors.

Correspondence may be directed to: Carolyn S. Dewa, MPH, PhD, Centre for Addiction and Mental Health, 33 Russell St., Toronto, ON M5S 2S1; tel.: 416-535-8501, ext. 4101; e-mail: carolyn_dewa@camh.net.

REFERENCES

Agency for Health Care Policy and Research (AHCPR). 1993. *Depression in Primary Care: Volume 2. Treatment of Major Depression*. Washington, DC: US Government Printing Office.

American Psychiatric Association (APA). 1993. "American Psychiatric Association Practice Guideline for Major Depressive Disorder in Adults." *American Journal of Psychiatry* 150: iii–26.

American Psychiatric Association (APA). 2000. *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.). Washington, DC: Author.

Archibald, G., G. Williams et al. 2007. *Introduction to Benefit Plans Around the World: A Guide for Multinational Employers*. New York: Mercer Human Resource Consulting.

Berndt, E.R., S. Finkelstein, P. Greenberg, R.H. Howland, A. Keith, A.J. Rush, J. Russell and M.B. Keller. 1998. "Workplace Performance Effects from Chronic Depression and Its Treatment." *Journal of Health Economics* 17(5): 511–35.

Browne, R.A., C.A. Melfi, T.W. Crogan, R.L. Obenchain, L. Morris, J. Smith, J. Gerlach, K. Copeland and R.L. Robinson. 1998. "Issues to Consider When Conducting Research Using Physician-Reported Antidepressant Claims." *Drug Benefit Trends* 10(5): 33, 37–42.

Canadian Network for Mood and Anxiety Treatment (CANMAT). 1999. *Guidelines for the Diagnosis and Pharmacological Treatment of Depression*. Toronto: Centre for Addiction and Mental Health.

Dewa, C.S., P. Goering, E. Lin and M. Paterson. 2002. "Depression-Related Short-Term Disability in an Employed Population." *Journal of Occupational and Environmental Medicine* 44(7): 628–33.

Dewa, C.S., J.S. Hoch, E. Lin, M. Paterson and P. Goering. 2003. "Pattern of Antidepressant Use and Duration of Depression-Related Absence from Work." *British Journal of Psychiatry* 183: 507–13.

Dewa, C.S., J.S. Hoch and L. Steele. 2005. "Prescription Drug Benefits and Canada's Uninsured." *International Journal of Law and Psychiatry* 28(5): 496–513.

Dewa, C.S. and E. Lin. 2000. "Chronic Physical Illness, Psychiatric Disorder and Disability in the Workplace." *Social Science & Medicine* 51(1): 41–50.

Duan, N., W.G. Manning, C.N. Morris and J.P. Newhouse. 1983. "A Comparison of Alternative Models of the Demand for Medical Care." *Journal of Business and Economic Statistics* 1(2): 115–26.

Edgell, E.T., K.H. Summers, T.R. Hylan, J. Ober and J.L. Bootman. 1999. "A Framework for Drug Utilization Evaluation in Depression: Insights from Outcomes Research." *Medical Care* 37(4 Suppl. Lilly): AS67–76.

Elinson, L., P. Houck, S.C. Marcus and H.A. Pincus. 2004. "Depression and the Ability to Work." *Psychiatric Services* 55(1): 29–34.

Foote, S. and L. Etheridge. 2000. "Increasing Use of New Prescription Drugs: A Case Study." *Health Affairs* 19(4):165–70.

Goldman, D. P., G. F. Joyce, J.J. Escarce, J.E. Pace, M.D. Solomon, M. Laouri, P.B. Landsman and S. M. Teutsch. 2004. "Pharmacy benefits and the use of drugs by the chronically ill." *Journal of the American Medical Association* 291(19): 2344-50.

Greenberg, P.E., R. Kessler, H.G. Birnbaum, S.A. Leong, S.W. Lowe, P.A. Berglund and P.K. Corey-Lisle. 2003. "The Economic Burden of Depression in the United States: How Did It Change between 1990 and 2000?" *Journal of Clinical Psychiatry* 64(12): 1465–75.

Hillman, A.L., M.V. Pauly, J.J. Escarce, K. Ripley, M. Gaynor, J. Clouse and R. Ross. 1999. "Financial Incentives and Drug Spending in Managed Care." *Health Affairs (Millwood)* 18(2): 189–200.

Katon, W., M. Von Korff, E. Lin, E. Walker, G.E. Simon, T. Bush, P. Robinson and J. Russo. 1995. "Collaborative Management to Achieve Treatment Guidelines. Impact on Depression in Primary Care." *Journal of the American Medical Association* 273(13): 1026–31.

Kessler, R.C., C.B. Nelson, K.A. McGonagle, J. Liu, M. Swartz and D.G. Blazer. 1996. "Comorbidity of DSM-III-R Major Depressive Disorder in the General Population: Results from the US National Comorbidity Survey." *British Journal of Psychiatry* (Suppl.) 30: 17–30.

Leibowitz, A., W.G. Manning Jr. and J.P. Newhouse. 1985. "The demand for prescription drugs as a function of cost-sharing." *Social Science and Medicine* 21(10): 1063-9.

Lim, D., K. Sanderson and G. Andrews. 2000. "Lost Productivity among Full-Time Workers with Mental Disorders." *Journal of Mental Health Policy and Economics* 3(3): 139–46.

Manning, W. G., C.N. Morris, J.P. Newhouse, L.L. Orr, N. Duan, E.B. Keeler, A. Leibowitz, K. H. Marquis, M.S. Marquis, and C.E. Phelps. 1981. "A Two-Part Model of the Demand for Medical Care: Preliminary Results from the Health Insurance Study." in J. van der Gaag and M. Perlman, eds. *Health, Economics and Health Economics* (pp. 103-23). Amsterdam, North Holland: Elsevier Science, Ltd.

Miranda, J., P.A. Arean and R.L. Rickman. 1994. "Relationship of Mental and Medical Disorders in Primary Care." In J. Miranda, A. Hohmann, C. Attkisson and D. Larson, eds., *Mental Disorders in Primary Care* (pp. 93–108). San Francisco: Jossey Bass.

Morgan, S., M. McMahon, J. Lam, D. Mooney and C. Raymond. 2005. *The Canadian Rx Atlas.* Vancouver: Centre for Health Services and Policy Research, University of British Columbia.

Motheral, B.R. and K.A. Fairman. 1997. "The Use of Claims Databases for Outcomes Research: Rationale, Challenges, and Strategies." *Clinical Therapeutics* 19(2): 346–66.

Offord, D.R., M.H. Boyle, D. Campbell, P. Goering, E. Lin, M. Wong and Y.A. Racine. 1996. "One-Year Prevalence of Psychiatric Disorder in Ontarians 15 to 64 Years of Age." *Canadian Journal of Psychiatry* 41(9): 559 63.

Olfson, M., S.C. Marcus, B. Druss and H.A. Pincus. 2002. "National Trends in the Use of Psychotropic Medications by Children." *Journal of the American Academy of Child and Adolescent Psychiatry* 41(5): 514–21.

Piette, J.D., M. Heisler and T.H. Wagner. 2004. "Cost-Related Medication Underuse among Chronically Ill Adults: The Treatments People Forgo, How Often, and Who Is at Risk." *American Journal of Public Health* 94(10): 1782–87.

Roberts, H.S. 1994. *Roberts' Dictionary of Industrial Relations* (4th ed.) (p. 173). Arlington, VA: BNA Books.

Salkever, D.S., H. Goldman, M. Purushothaman and J. Shinogle. 2000. "Disability Management, Employee Health and Fringe Benefits, and Long-Term Disability Claims for Mental Disorders: An Empirical Exploration." *Milbank Quarterly* 78(1): 79–113.

Simon, G.E., M. Von Korff, E.H. Wagner and W. Barlow. 1993. "Patterns of Antidepressant Use in Community Practice." *General Hospital Psychiatry* 15(6): 399–408.

Statistics Canada. 2003. "Labour Force Survey." FAQ. Retrieved September 26, 2008. <http://www.statcan.ca/english/survey/labour/labour.htm>.

Statistics Canada. 2007. "Average Hourly Wages of Employees by Selected Characteristics and Profession, Unadjusted Data, by Province (Monthly) (Canada)." Retrieved September 26, 2008. <http://www40.statcan.ca/l01/cst01/labr69a.htm>.

Tamblyn, R., R. Laprise, J.A. Hanley, M. Abrahamowicz, S. Scott, N. Mayo, J. Hurley, R. Grad, E. Latimer, R. Perreault, P. McLeod, A. Huang, P. Larochelle and L. Mallet. 2001. "Adverse Events Associated with Prescription Drug Cost-Sharing among Poor and Elderly Persons." *Journal of the American Medical Association* 285(4): 421–29.

Von Korff, M., E.H. Wagner and K. Saunders. 1992. "A Chronic Disease Score from Automated Pharmacy Data." *Journal of Clinical Epidemiology* 45(2): 197–203.